GAO

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Report to the Secretary of the Army

June 1986

SOFTWARE PROJECTS

Army Materiel Command Spent Millions Without Knowing Total Costs & Benefits

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GAO

United States
General Accounting Office
Washington, D.C. 20548

Information Management and
Technology Division

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June 20, 1986

The Honorable John O. Marsh, Jr.
The Secretary of the Army

Dear Mr. Secretary:

This report discusses why the Department of the Army needs to follow required procedures when it modifies or expands its automated Commodity Command Standard System. We performed the review to find out whether the Army Materiel Command, through its Logistics System Review Committee, effectively managed and controlled the projects associated with this computer system.

The report contains recommendations to you in chapter 2. As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report. A written statement must also be submitted to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Secretary of Defense; the Chairmen, House and Senate Committees on Armed Services and on Appropriations, House Committee on Government Operations, and Senate Committee on Governmental Affairs; and the Director, Office of Management and Budget.

Sincerely yours,

Warren G. Reed
Director

Executive Summary

Purpose

The Army Materiel Command extensively uses the Commodity Command Standard System to manage its $24-billion inventory of supply items. The Command spends between $25 million and $30 million annually on software projects that expand and modify the system. GAO performed this review to find out whether the Command, through its Logistics System Review Committee, effectively managed and controlled these projects. Specifically, GAO evaluated 12 projects to determine whether the Committee ensured that project managers

- prepared, for use in the decision-making process, economic analyses, which are intended to demonstrate that expected benefits are worth the cost of the project and
- tracked and reported project costs.

GAO also examined the Command's review of completed projects to determine if planned objectives and benefits have been achieved.

Background

The Command has six inventory control points nationwide to control stock, manage and catalog supplies, and procure and finance Army supply items. The Commodity Command Standard System provides common computer programs for use by all these control points.

Army regulations require that decisions to modify or expand this system be based on an analysis of the software project's estimated costs and benefits. An economic analysis is required when the estimated cost of the project exceeds $100,000. Specified procedures are to be followed for developing the economic analysis. And, the analysis should be updated when assumptions become invalid, estimated costs exceed estimated benefits, or new alternatives become available. Also, project managers are required to estimate and track costs by project development phase so that corrective action (project continuation, redirection, or termination) can be taken by the Logistics System Review Committee when needed. When project development is completed, reviews should be made to document whether expected benefits have been achieved. Savings projected in the economic analysis must be auditable so that actual cost reductions can be tracked and reflected in future budget submissions.

Results in Brief

Officials of the Logistics System Review Committee have allowed the Commodity Command Standard System to be modified or expanded in violation of Army regulations. Specifically, the Committee approved the

initiation and continuance of system changes without requiring that (1) economic analyses be complete and accurate before a change was approved and (2) project costs be tracked and reported. Additionally, the Army Materiel Command did not require that completed projects be reviewed to determine if expected benefits were achieved. Consequently, the Command does not know and cannot demonstrate whether expected benefits are being realized from the millions spent annually to modify and expand the system.

Principal Findings

Justifying and Approving Projects

GAO reviewed nine ongoing projects costing more than $100,000 and three completed projects costing more than $1 million each. Of these 12 projects, 6 were not supported by required economic analyses. Economic analyses had been prepared for the other 6 projects, but they were flawed: two did not state benefits in measurable terms; four omitted required cost information; and none considered contracting as an alternative, or assessed cost and benefit uncertainties (or risks). The project managers responsible for preparing the analyses said they were unaware of all the cost elements that should be included and did not know how to or did not estimate project benefits and/or costs. Nevertheless, the Committee approved all 12 projects without having required information to determine whether such decisions were the most economical use of available resources, the expected benefits were worth estimated costs, or the selected approach was the most cost-effective alternative. (See pp. 15 to 23.)

Controlling Costs

Once approved, seven of the projects were started without project managers establishing required cost estimates for each major development phase. Also, these projects continued to be developed without incurred costs being tracked or reported to the Committee. For four of the six projects supported by economic analyses, major project changes or decisions occurred, but cost and benefit estimates on the economic analyses were not updated. Because cost information was not tracked and reported to the Committee, projects were allowed to continue when required economic analysis updates should have been made to ensure that costs were under control and that the project should be continued. For example, GAO estimated that expected costs were exceeded by 200

percent for two of the three major projects reviewed that cost more than $1 million. (See pp. 23 to 26.)

Achieving Benefits

The Command has reviewed only 2 of the 28 projects (completed since 1980 and costing over $100,000) to determine whether expected benefits were achieved. One of these projects was 1 of the 12 projects GAO reviewed. But the two reviews were flawed, and the Command could provide no verification of the claimed measurable savings resulting from these projects. This is, in part, because the Command had not collected the data necessary to verify that expected benefits and savings were achieved. (See pp. 26 to 28.)

Recommendations

GAO believes that, before taking any corrective action, the Secretary of the Army should consider the desirability of continuing to use the Logistics System Review Committee as the approval and project managing authority for system changes. After this has been considered, GAO recommends that the Secretary direct the Commander, Army Materiel Command, to:

- Ensure that the Command's approval authority adheres to all pertinent Army and Command regulations regarding the approval of software changes and the tracking, updating, and reporting of costs associated with such changes.
- Review completed software projects for the Commodity Command Standard System to determine if expected benefits and cost reductions have been achieved, so that this information can be included as part of the Army's annual budget submission.

An additional recommendation is cited on page 29.

Agency Comments

The Department of Defense generally agreed with the report's findings, conclusions, and recommendations and assured GAO that the Army Materiel Command would follow required software development procedures. Although Defense agreed that economic analyses were not always prepared, it maintained that such analyses were not required for all the projects GAO reviewed. GAO disagrees because the conditions for when an economic analysis is not required did not apply to the projects reviewed by GAO. (See appendix II for Defense's specific comments and GAO's responses.)

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Abbreviations

ALMSA	Automated Logistics Management Systems Activity
AMC	Army Materiel Command
CCSS	Commodity Command Standard System
GAO	General Accounting Office

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Introduction

The Commodity Command Standard System (CCSS) is the Army's automated wholesale logistics system for stock control, supply management, cataloging, provisioning, procurement, maintenance, and financial management of an inventory of supply items valued at about $24 billion. The Army Materiel Command (AMC) relies extensively on CCSS to efficiently and effectively manage this inventory. In 1967, AMC created the Automated Logistics Management Systems Activity (ALMSA) to be the exclusive developer and maintainer of CCSS which, by 1977, was operational at the Army's six national inventory control points. In fiscal year 1985, ALMSA employed about 620 people and spent about $30 million, principally for CCSS projects.

Approval Process for CCSS Projects

AMC uses a Logistics System Review Committee to (1) provide guidance on system change requests that expand or modify CCSS and (2) review and approve these requests and then rank them. The Committee also reviews AMC's automated data systems publications and performs other tasks as spelled out in AMC Regulation 15-23, Logistics System Review Committee. The Committee is chaired by the AMC Assistant Deputy for Materiel Readiness; committee members are the commanders from each of the national inventory control points and selected senior officials from AMC headquarters.

System change requests are presented to the Committee by user groups, each of which is comprised of representatives from national inventory control points and from AMC headquarters and represents a functional area, such as supply, procurement, or provisioning. The user groups meet semiannually to evaluate and rank proposed projects before submitting their system change request packages to the Committee. These packages should (1) contain a short description of the project and why it is needed and an estimate of costs and benefits and (2) clearly justify implementation and describe the impact of the proposal on other projects in the AMC work plan (in accordance with Army Regulation 18-1, Management Information Systems Policies, Objectives, Procedures and Responsibilities). The Committee meets at the Chairman's discretion (but at least four times annually) to evaluate each group's system change requests against AMC's priorities and approves or disapproves the projects accordingly.

Once a software project is approved, the user group Committee member appoints a manager to develop and carry out the project and to prepare and update all the necessary paperwork (for example, the economic analysis). The manager is usually from AMC headquarters and is the

chairperson for the user group. At the same time, the Committee gives the approved project to AMC's Deputy Chief of Staff for Automation and Information Management who, in turn, assigns and directs ALMSA work on CCSS projects. ALMSA analysts and programmers are assigned to develop the required software product for a designated ALMSA supervisor, who coordinates the progress of the software project with the project manager at AMC headquarters. The AMC project manager reports to the Committee, and the ALMSA Director reports to the Deputy Chief of Staff for Automation and Information Management.

Objective, Scope, and Methodology

Our objective was to evaluate how AMC managed changes to CCSS software. To achieve this, we examined whether AMC

- prepared and used economic analyses in the project approval decision-making process,
- tracked and reported CCSS project costs, and
- reviewed completed projects to determine if planned objectives and benefits were achieved.

To make these assessments, we asked ALMSA to identify all ongoing CCSS projects that were started between October 1981 and May 1984. Our criteria for selecting some of these projects were:

- Cost. We looked at projects expected to cost over $100,000; Army Regulation 18-1 requires that these projects be supported by an economic analysis and other life-cycle documents and that they follow specific project management procedures.
- Development status. We selected only those projects under development long enough for their status and cost to have been reported to the Committee.
- Functional utility. To be selected, projects must also have been designed specifically to meet user requirements versus projects designed specifically to improve computer operations or software efficiency.

From a list of about 1,200 projects provided to us by ALMSA, we selected 25 projects, each having estimated development costs exceeding $100,000. Of the 25 projects, 15 did not meet the above criteria and thus were eliminated: 5 had been stopped and deferred shortly after being started so that higher priority user needs might be met; 3 were incorrectly identified as costing more than $100,000; 3 were directly related

to improving computer operations only, and not to meeting user requirements; 3 came under the Department of Defense's and not AMC's direction; and 1 was already completed, although ALMSA reported it as still under development. In addition to the 15 projects that did not meet our criteria, we excluded one other project because it was being reviewed by the Army Audit Agency.

The nine projects meeting our criteria were:

- Cataloging Distributed Data Processing System—an automated system to catalog inventory items.
- Common Test Data Collection System—an automated system to collect AMC test data.
- Select, Stratify, Summarize and Sequence System—an automated system to cross-reference items in support of specific equipment.
- Provisioning Master Record Update System—an on-line system to query or update AMC provisioning records.
- Total Package Unit Materiel Fielding System—an automated system to help consolidate orders of initial repair parts and other initial support items.
- Work Order Reporting Communication System—an automated system to generate and transmit fund data between two national inventory control points.
- Multi-function Workstation—a collection of office automation systems, such as word processing and electronic mail.
- Modifications to the Army Procurement Appropriation Reporting System—an automated accounting system.
- Security Assistance Automation Army—an automated system to support the Army's security assistance to foreign countries.

In addition to these ongoing projects, we identified 28 projects costing over $100,000 that were completed since 1980 by ALMSA. Of these, we selected three. Each project had cost over $1 million and had been completed between October 1981 and June 1984. They were:

- Army Procurement Appropriation Reporting System—an automated procurement accounting system.
- Procurement Automated Data Document System—an automated system to process procurement documents, such as contracts.
- Provisioning Master Record Redesign—a major redesign of the provisioning system.

We examined these three because a significant amount of money had been invested in them, and we expected that required management procedures would have been followed. In total, we reviewed 12 projects—9 ongoing and 3 completed.

We also reviewed Army and AMC policies and guidelines on how computer projects should be approved and managed. Using criteria in these policies and guidelines, we examined the following:

- Economic analyses used to justify the projects. We focused on completeness and compliance with regulations.
- Cost controls used by project managers for managing approved CCSS projects.
- Follow-up procedures used to determine if approved projects achieved expected benefits.

We performed our review in accordance with generally accepted government auditing standards from August 1983 through January 1985 at these locations:

- AMC Headquarters, Alexandria, Virginia.
- ALMSA, St. Louis, Missouri.
- Army national inventory control points:
  - Aviation Systems Command, St. Louis, Missouri
  - Troop Support Command, St. Louis, Missouri
  - Tank Automotive Command, Warren, Michigan
  - Missile Command, Huntsville, Alabama
  - Communications and Electronics Command, Fort Monmouth, New Jersey

We evaluated information from, but did not visit, the sixth national inventory control point, the Armament, Munitions, and Chemical Command in Rock Island, Illinois; we decided that the data needed from this site could be obtained by letter and through telephone inquiry instead.

At AMC Headquarters we evaluated the adequacy of the Committee's oversight of national inventory control points and ALMSA software projects and interviewed project managers to determine whether they had adequate cost control over their projects. At ALMSA, we evaluated economic analyses for the selected software projects, interviewed system development personnel, and analyzed software project cost rates as well as cost tracking and reporting practices. Our work at the

national inventory control points consisted of determining how actual benefits from completed CCSS projects were identified, documented, and compared to expected benefits.

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Required Procedures Are Not Followed in Reviewing, Approving, and Managing Software Projects

When project costs are expected to exceed $100,000, Army and AMC regulations require that the Logistics System Review Committee base decisions to approve each system change request on an economic analysis of the project's benefits and costs. The economic analysis is to include the project's estimated life-cycle costs and is to be updated by the project manager when the initial assumptions become invalid, estimated benefits or costs change, or new alternatives become available. When reviewing, approving, and managing system change requests, the Committee and its project managers have not adhered to required policy and procedures in Army and AMC regulations regarding the preparation, use, and updating of the economic analyses. The Committee has approved projects and allowed ongoing projects to continue for which

- economic analyses were not prepared, although estimated costs exceeded $100,000;
- economic analyses were prepared, but they were either incomplete or inaccurate or both; and
- costs were not tracked and reported to the Committee after approval.

As a result

- available resources may not have been used economically;
- the benefits generated by projects may not have been worth the costs; and
- there is no assurance the best and most cost-effective way of developing the projects was selected.

AMC spent about $235 million during fiscal years 1977 (when CCSS became operational) through 1985 principally to modify and expand CCSS. Of the 28 projects completed by ALMSA since 1980 and costing over $100,000, AMC has reviewed only 2 to determine if planned objectives and expected benefits were achieved. One of these two was included in our review of completed projects. AMC's review of that project was incomplete because the Command did not validate and document the savings and benefits claimed as being achieved. Because reviews of completed projects either were not performed or were performed inadequately, AMC does not know if it has received a return on its investment of dollars and human resources, whether the return has been worth the cost, or if expected benefits were achieved.

Required Economic Analyses Are Not Always Prepared

Economic analyses were not prepared and used in the decision-making process for 6 of the 12 software projects we reviewed. All of the 12 projects cost over $100,000[1]—the Army's threshold for requiring an economic analysis before a project is approved. When projects were submitted to the Committee for approval, each should have included a short description of the project and an economic analysis stating available alternatives and expected costs and benefits. Because the Committee approved these six projects without the prescribed economic analysis of alternatives, it could not be assured that the most effective and economical approach had been selected.

Economic Analyses Are Required

Before 1980, Army Regulation 18-1 required that decisions to acquire or develop automated data systems operating at multiple locations, such as CCSS projects, be based on an economic analysis, regardless of project cost. Since 1980, when this regulation was revised, an economic analysis has been required for new data systems and modifications expected to cost more than $100,000, regardless of the number of locations at which they are expected to operate. Such analyses are required to include quantified and non-quantified, mission-related objectives, such as improved performance, cost savings, or cost avoidances. Also, AMC Regulation 15-23 requires that an economic analysis be included in the project package submitted to the Logistics System Review Committee for evaluation. This analysis is important in helping the Committee decide to approve or disapprove the project.

Reasons Vary for Not Preparing Economic Analyses

An economic analysis is an important and helpful tool for making decisions on whether to approve or disapprove a project. Under circumstances where a project is directed to be done, an economic analysis also serves a useful purpose; it can be used to help (1) identify the best way to develop and implement the directed project, (2) identify alternatives for developing and implementing the project, and (3) analyze expected benefits/costs. The Committee chairman and the project managers gave differing reasons why economic analyses, though mandatory, were not prepared for the six projects. According to the chairman, procedures were not followed for two of the six projects because one was justified on the basis of non-economic reasons and the other was needed to meet

[1]Project costs were estimated by multiplying ALMSA's estimated (or actual) labor hours for developing these projects times the applicable hourly rate that ALMSA used at the time the projects were initiated. As discussed on page 21, we believe the hourly rates used were too low, resulting in an understatement of the ALMSA cost to develop these projects. The estimates are further understated because they do not include other major costs that are discussed starting on page 20 in this report.

mission requirements. In these instances, he said, there is no choice but to do the work, regardless of cost and expected benefit; therefore, the Committee does not require an economic analysis.

This rationale does not recognize the need to analyze available alternatives for doing directed work and then selecting the approach that will meet the need at the lowest cost. It also does not conform to requirements set forth in Army Regulation 11-28:

"A program or project, justified on the basis of military necessity, will not be exempt from the requirement for an economic analysis.... Closely tied to the analysis of the relative need...is the consideration of alternative ways to accomplish the program or project."

In the Committee's minutes, dated May 1, 1984, the chairman pointed out that AMC's computer resources were limited and should be used as effectively as possible. Without an economic analysis, it is possible that the least costly way of performing individual projects may not have been selected or that AMC's limited computer resources are not being used in the most economical manner.

We could not determine from our review of the records of the remaining four projects why economic analyses were not prepared. During our review, we requested that the chairman explain or provide documents on these four, but we did not receive a response.

Project managers for five of the six projects told us that they had not prepared required economic analyses for the following reasons:

- The Committee did not direct that an economic analysis be prepared. One project manager said that it was his understanding that AMC's policy was to not prepare an analysis unless directed to do so by the Committee.
- The project was a modification to an existing system. The project manager said that he did not know an economic analysis was required for system modifications if estimated costs exceeded $100,000.
- The Committee did not request that an analysis be completed because the project was a high priority of AMC's top management and considered mission essential.
- Another project manager was unaware that ALMSA had estimated that his project would cost over $100,000 and would thus require an economic analysis.

- The capability being automated had been included in, but was later eliminated from, an approved project for which an analysis was prepared; it then became a separate project of over $100,000. The project manager said he did not know that an economic analysis was required in such a case.

The original project manager for the sixth project no longer works for AMC, and the current manager could provide no documents that explained why an economic analysis was not prepared.

Prepared Economic Analyses Are Flawed

An economic analysis had been prepared for 6 of the 12 projects we reviewed. Army Regulation 11-28[2] identifies specific information to be contained in an economic analysis. Also, Army Technical Bulletin 18-109 specifies that benefits should be stated in dollar terms or non-monetary measurable results that can be used to estimate the project's worth and to compare alternatives. This information is to be used by approving authorities when making decisions about the projects.

But these six analyses were flawed because (1) the Committee had not required that the project proposals be complete and accurate; (2) project managers said they were unaware of all components of information required for an economic analysis; or (3) project managers said they did not know how to estimate the cost and benefits of the projects. As a result, required information needed for assessing alternatives and expected costs and benefits was missing from the analyses.

- Two did not state the expected benefits in measurable terms.
- None assessed contracting as an alternative to in-house development.
- Four omitted required cost information.
- None assessed the cost/benefit uncertainties (or risks).

In addition, we found that required procedures had not been used in calculating costs for the six analyses. According to Office of Management and Budget Circular A-94 and Army policy and regulations, benefits and costs used to calculate future costs and benefits must be

[2]In addition to this regulation, in July 1985, the Command issued AMC Pamphlet 11-28, Army Programs Economic Analysis Concepts and Methodologies. This pamphlet was issued to help ensure that economic analyses are more complete and that project managers are aware of all components of information required for economic analyses. Since this pamphlet was issued after the completion of our audit work, we did not assess its impact.

discounted[3] to their present value. Four of the analyses did not use discounted values.

In assessing costs and benefits in the economic analyses, we found that the hourly rate used to estimate project development costs has been consistently understated. To evaluate what impact understated hourly rates had on the overall project approval process, we went beyond the 12 projects selected for review. We examined the development costs of 1,264 system change requests approved between October 1981 and May 1984, which were estimated to cost less than $100,000. We found that 27 of the 1,264 systems change requests would have been estimated as costing in excess of $100,000 had the proper rate been used. An economic analyses would then have been required before these projects could be approved.

Expected Benefits Are Not Measurable

Two of the six economic analyses we reviewed did not have the expected benefits quantified so they could be measured to determine their impact on AMC's mission. Further, the Committee did not have quantified information for (1) determining whether the expected increase in productivity was commensurate with the increased costs and (2) demonstrating that the project would achieve expectations.

One project, estimated to cost about $856,000, was to standardize and simplify a work ordering and communication system at the national inventory control points. The analysis did not state the benefits in quantifiable terms, such as dollars. Nor did it state how national inventory control points' operations would be measured to determine expected improvements. The expected benefits were stated in the "Basis for Need" section of the Mission Element Need Statement included in the project package: "The currently used regulations outlining methods and procedures for authorizing work-orders are conflicting, outdated, and do not meet the needs of the user." This section also stated that:

[3]The need for discounting arises because benefits and costs associated with automatic data processing development projects usually are not experienced in the same time period. A dollar of benefits (or costs) expected next year is worth less today than a dollar of benefits (or costs) experienced in the current period. The further into the future a benefit or cost is, the smaller is its equivalent present value. For example, if the rate used in discounting is 10 percent, then $100,000 to be received or spent during the first year of the project is equivalent to $95,400 in present value. The same $100,000 to be received or spent during the second year of the project has a present value of $86,700. By convention, all future benefits and costs should be measured in terms of their present value. Decisions made today must compare alternatives for which costs and benefits are experienced today, and those stretched out over the future.

"Action must be taken to resolve ambiguities and conflicts between three current systems, update the system to fulfill current user needs; and, develop a capability of automatically reporting status/data between the initiating activity and the performing activity."

We do not believe this to be a statement of benefits in quantifiable terms.

The other project was to develop office automation applications, such as word processing and electronic mail. In July 1983, the project was estimated to cost $640,000.[4] The economic analysis stated this project would increase productivity, but it did not quantify the expected increase, note when it would be achieved, or identify how it could be measured. We believe that the decision to approve the project was based on inadequate information on expected productivity increases with which to compare the cost estimate. Also, since no quantifiable goal was set for productivity increases, no criteria exist for determining whether the project has been successful.

Contracting Was Not Considered as an Alternative

None of the six analyses we reviewed included an assessment of contracting as an alternative. Office of Management and Budget Circular A-76 encourages agencies to contract for those functions, such as software development, that can be performed commercially at less cost. A Command official told us that about 5 years ago AMC decided not to consider and document, by individual project, contracting for software development as an alternative to developing it in-house. Instead, AMC reviews its total ALMSA work load to identify projects suitable for contracting and then ranks these projects against available contract funds, about $2 million annually, before awarding the contracts. According to the AMC official, this decision was based on AMC's belief that software development was not a commercial activity subject to requirements in Circular A-76. However, the Department of the Army official responsible for the Army's contracting program told us that software development is clearly a commercial activity and that contracting should be evaluated as an alternative before major in-house software development efforts are started. Because contracting has been considered in aggregation and not as an alternative for each individual project, the Committee could not have been certain that the best possible use of AMC's limited computer resources was made at the lowest possible cost for the projects it approved.

[4]The present value was not calculated.

Required Costs Are Omitted

Four of the six economic analyses we reviewed did not include cost elements required by Army Technical Bulletin 18-109. For example, the following cost elements, 2 of the 38 identified in the bulletin, were not included:

- ALMSA's estimated costs to maintain the software after it becomes operational.
- Estimated computer center operating costs after the software becomes operational at the national inventory control point.

The technical bulletin, which applies Army-wide, requires that these cost elements be included in the economic analysis so that an approval authority, such as the Committee, can determine whether expected benefits would be worth the investment and operating costs. We examined these two cost elements because their omission causes project costs to be understated and could have mislead the Committee in its determination.

Three of the six analyses did not include cost estimates for expected ALMSA software maintenance efforts after the project became operational. Maintenance of computer programs after they are placed into operation includes modifications to make the programs do more or different tasks, to remove defects, or to reduce operating costs. We reported in 1981[5] that these software maintenance costs could be substantial. The three analyses that did include estimates for software maintenance costs demonstrate our point. For example, one analysis we reviewed estimated that software maintenance costs would be $4.9 million over 10 years, while development costs would be only $2.3 million.[6] A project manager told us that he did not include these costs because they would not be incurred until after the 8-year period covered by the economic analysis. In our opinion, this occurrence would be unusual since the other AMC project managers expected such costs to start shortly after the systems became operational at the national inventory control points.

Four of the six analyses did not include the national inventory control points' estimated computer center operating costs to cover such items as equipment, personnel, and supplies. Estimates in the other two economic

[5]Federal Agencies' Maintenance of Computer Programs: Expensive and Undermanaged (AFMD 81-25, Feb. 26, 1981).

[6]The present value was not calculated.

analyses we reviewed showed that these costs can be large when compared to development costs. For example, one project's estimated computer center costs were about $40,000 a year for an 8-year life, while development costs were estimated to be $567,000. We could not ascertain the project managers' rationale for not including this cost information. However, one of the managers said he omitted these costs because it was his understanding they would be taken out of the operating activities' budgets. Even so, regulations require that such costs be included in the project's economic analysis.

Failure to do so resulted in an understatement of total project costs. We believe this weakened the Committee's ability to determine whether expected project benefits were commensurate with estimated costs.

Cost and Benefit Uncertainties Are Not Being Assessed

None of the six economic analyses included a quantified assessment of the risk and cost/benefit uncertainties. Costs and benefits reported in economic analyses are estimates; therefore, they involve uncertainties. A risk analysis assesses the probability of these uncertainties occurring and their potential impact. This is done by examining the key cost, benefit, and environmental factors and their relationships to variations in stated assumptions. For example, one project we reviewed expected contract preparation costs to be reduced from $200 to $80 a contract. However, the likelihood of this cost reduction occurring was never assessed.

Assessment of cost/benefit uncertainties is required by Army Technical Bulletin 18-109 and is intended to aid decision makers in evaluating the relative merits of proposed development efforts. Project managers said they did not know that project risks were to be identified or that the probability of occurrence should be analyzed and stated in the economic analysis.

ALMSA Cost Estimates Have Been Understated

The ALMSA cost estimates used to help determine a project's total costs were understated on all of the economic analyses we reviewed. This is because the hourly rates used to estimate ALMSA's costs to modify and expand CCSS were understated. These rates represent direct labor, indirect labor, and overhead costs; they are used in estimating ALMSA's costs on the basis of the number of direct labor hours to be spent on the projects. This cost estimate comprises one of two elements AMC uses to estimate ALMSA's cost. The second element is the ALMSA computer center cost, which is estimated based on computer hours to be used in developing the projects. We did not evaluate the accuracy of the cost rate

attributable to this second element because necessary historical data were not available. Combined, these two elements represent ALMSA's total costs.

From 1979 through 1982, ALSMA used $17 and $19 hourly rates and, between 1983 and July 1984, it used a $41 hourly rate. Since July 1984, ALMSA has been using a $47 hourly rate to estimate CCSS software project costs. In our opinion all of these rates were understated, and the $47 rate should have been $69 in 1984 and $74 in 1985.

AMC's determination of the 1984 rate not only demonstrates the flaws in its methodology but has also resulted in inaccurate rates. AMC calculated the 1984 hourly rate of $47 by dividing ALMSA 1983 fiscal year costs by direct labor hours—$21 million divided by 448,922 direct labor hours.[7] But, in determining which costs should be considered, AMC (1) excluded ALMSA's costs for administrative support and for development of office automation software—$2.1 million; (2) understated employee fringe benefit costs by about $3.5 million by using a factor of 10.9 percent (believed to be more reflective of ALMSA benefit costs) to estimate such costs rather than the Office of Management and Budget's required 27.3 percent; and (3) overstated the number of direct labor hours used in the calculation.

At our request, ALMSA provided data that showed the fiscal year 1983 direct labor hours reported were actually 387,799. This figure is 61,123 labor hours fewer than the 448,922 hours ALMSA used when it calculated the $47 rate. ALMSA incorrectly classified the 61,123 hours as direct rather than indirect labor hours, and they were therefore used in calculating the hourly rate. The 61,123 hours were for indirect labor, such as administrative support, and are hours spent supporting numerous ALMSA projects rather than a specific project. Therefore, the 61,123 hours should not have been used in the calculation.

The costs that ALMSA excluded, $2.1 million, were for its Activity Information Management Division (an administrative support division), which designed, developed, and maintained ALMSA's internal management information systems, and for its Workplace Automation Division, which designed, developed, and maintained standard work-place automation systems for AMC. These costs are for ALMSA operations that support all CCSS projects and office automation for the national inventory

[7]The present value was not calculated.

control points and therefore should be used in calculating ALMSA's hourly cost rates.

Using these actual cost elements and following the same methodology used by AMC, we calculate that the hourly rate in 1984 should have been $69 instead of $47. ALMSA hourly rates for fiscal years 1979 through 1985 should have been about 1.5 to 3.7 times more than those used by AMC. Table 2.1 shows the rates AMC used and those we believe should have been used. Using these rates has meant that, between 1979 and 1985, AMC consistently understated development costs not only for the projects we reviewed, but for all CCSS projects.

Therefore, many projects in the less-than-$100,000 range should have been estimated to cost more than $100,000 and would thus have required an economic analysis. Using our estimated hourly rate applicable when the project was received by ALMSA as the basis for estimating project costs, we identified 27 projects received by ALMSA between October 1981 and May 1984. These projects had been estimated to cost less than $100,000 but, in fact, should have been estimated to cost over $100,000 and would therefore have been required to be supported by an economic analysis before being approved by the Committee.

Table 2.1: AMC's Hourly Labor Rate

Fiscal year	ALMSA's hourly rate	GAO's estimated hourly rate[a]	Percent difference
1979	$17	$44	260
1980	$17	$46	270
1981	$17	$53	310
1982	$19	$71	370
1983	$41	$70	170
1984[b]	$41	$69	170
1984[c]	$47	$69	150
1985	$47	$74	160

[a]The decline in our calculated 1983 and 1984 hourly rates occurred because the direct labor hour increase was greater than the increase in ALMSA's cost.

[b]Period covers October 1983 - June 1984.

[c]Period covers July 1984 - September 1984.

Project Costs Are Not Tracked, Updated, and Reported

Once projects have been approved, the Committee is responsible for determining whether they should continue to be developed, need redirection, or should be terminated. When and how this determination is made is at the Committee chairman's discretion. To ensure that project development costs are managed and the economic analysis updated throughout the project, Army technical bulletins and regulations require that project managers track, update, and report costs. However, the Committee had not required project managers to update economic analyses and to track or report costs to the Committee as the projects progressed.

Current Project Costs Are Needed

Updated cost information can help the Committee to determine if projects are exceeding costs and should be discontinued or redirected. Army Technical Bulletin 18-100 requires project managers to establish cost estimates by development phase and track and report costs as the development progresses so that corrective action can be taken when costs or time exceeds estimates by 15 percent. In addition, AMC Regulation 15-23 requires the Committee to approve the decision on whether projects should continue, be redirected, or be terminated. Army Regulation 11-28 requires that cost and benefit estimates used in economic analyses be updated by the project manager when (1) assumptions become invalid, (2) available information indicates costs may exceed benefits, (3) new alternatives become available, or (4) specific milestone decisions are to be made. Updating the cost information enables the project manager to assess the impact of the change and to take steps to identify and implement corrective actions, if needed.

The Committee receives periodic briefings on projects' status and on problems that may delay project completion beyond the planned date. The information reported includes some but not all costs. We found that two of the three completed projects we reviewed had exceeded estimated costs—one by 260 percent and the other by 200 percent. Further, two of the nine ongoing projects had already exceeded approved cost estimates. Project managers for only 2 of the 12 projects had established and tracked costs.

We could not determine whether managers for two other projects had established cost estimates by development phase or tracked development costs because neither manager was still employed at AMC, and the needed documentation was not available. The last of the 12 projects did not have a project manager assigned because the original project cost

estimate was less than $100,000. We determined that the current cost estimate for this project, however, exceeds the $100,000-threshold.

The Army's procurement appropriation accounting system project illustrates what can happen if project managers do not track, update, and report costs to the Committee. This project started in March 1979 with an estimated completion date of June 1982. It was expected that 55,524 direct labor hours would be needed to perform the work at a cost of $1.05 million. We determined that by May 1984, 145,000 direct labor hours (260 percent of the expected number of hours) had been used for the project—about 90,000 more than estimated. By using AMC's $19 labor rate in effect at the time the cost was estimated, this 90,000-hour increase calculates to $1.7 million.[8] But, using our adjusted hourly rate for that same period, we estimate the cost to be $5.3 million —a $3.6-million increase.

Had the project manager tracked and compared actual and estimated project costs as required by Army regulations, the increase in direct labor hours would have been identified and should have been included in the project status report to the Committee. The Committee could have then considered this cost information in its determination of whether the project should continue. As it was, this significant cost increase was not identified, tracked, or reported.

The Committee chairman told us that, in his opinion, the limited cost information being provided to the Committee was sufficient because cost was not the primary basis for Committee decisions. What is important, according to the Chairman, is whether ALMSA's computer resources are being used effectively. Further, he said, from the periodic briefings the Committee receives, it can determine when a project's resource needs are affecting other projects which, in turn, may hamper use of ALMSA's computer resources. Finally, he said this was sufficient information for the Committee to manage projects and to direct the Command's computer resources. We disagree. Our review showed the Committee is provided ALMSA direct labor hours and user group travel costs. The Committee is not generally provided ALMSA computer costs, contract costs, or the cost of national inventory control point personnel temporarily assigned to ALMSA to work on a project. In our opinion, the Committee needs total cost information if it expects to compare costs and benefits periodically to properly decide a project's fate.

[8]Direct labor hours are the hours charged directly to an ALMSA development project by personnel, such as programmers and analysts.

ALMSA Can Help Track Project Costs

The ALMSA project tracking system is not used to help project managers track and update project costs, as required by Army regulations. Instead, the system, as designed, is used to record ALMSA direct labor hours by individual system change request; it does not aggregate these hours by project (even though some projects have more than one change request) or convert the hours to dollar costs.

According to an ALMSA Division Director, ALMSA's tracking system could be changed so that individual system change requests are aggregated and reported to the project manager by project during the development cycle. The director said the capabilities needed to capture the direct labor hours by project could be added to the existing tracking system without major and costly modification.

In our opinion, ALMSA has made no effort to identify a means of capturing a project's direct labor hours because the project managers have not tracked, updated, and reported costs as required by Army regulation. We believe ALMSA's system can be made to relate direct labor hours to a project so that AMC project managers would have the facility to (1) track, update, and keep better informed about their projects' status and (2) determine when costs are being exceeded and make required reports to the Committee.

AMC Rarely Determines Whether Expected Benefits Have Been Achieved

Since 1980, AMC has reviewed 2 of 28 completed ALMSA projects costing more than $100,000 to determine whether expected benefits were achieved. One of these, the procurement appropriation accounting system, was included in our review. The second project was not included because it was being reviewed by the Army Audit Agency. In its report on Management of the U.S. Government, Fiscal Year 1986, the Office of Management and Budget cited that the government's investments in information must be treated in a business-like manner, and the gains from automated projects should be verified. Also, the Office of Management and Budget plans to require federal managers to use tracking systems to capture returns on investment in dollars or estimated benefits. Army Regulation 18-1 recognizes the need for such reviews, and Army Technical Bulletin 18-109 states that savings identified in economic analyses must be auditable (verifiable) so that review officials can track actual reductions. Except for these two reviews conducted during 1984, AMC had not examined completed projects to determine if expected benefits were achieved. Nor had the Command collected the data needed to perform these reviews; thus, it could not determine whether expected benefits had been achieved.

Notwithstanding, the chairman said he believes that investments in CCSS have contributed to improvements in AMC's supply and inventory management processes. He cited as examples improvements in logistics management, such as a 3-percent increase in stock availability and a 15-percent reduction in the number of backorders for supply items. However, the chairman was unable to demonstrate how these savings had resulted from ALMSA changes to CCSS.

Although AMC had projected about $50 million[9] in benefits for two of the three completed projects we reviewed, it had not conducted needed post-implementation reviews to determine whether those benefits were actually realized. For example, one of these, the procurement document preparation system, estimated preparation cost reductions from $200 to $80 per contract and several other cost reductions for a total expected savings of $30 million. We asked officials at AMC headquarters and at four national inventory control points we visited for data or documentation substantiating that these projected savings had been realized. The officials said they did not know whether the savings had been realized. They also said that, because they had not collected the cost and performance data needed to determine if these preparation costs had decreased, it would be difficult to reconstruct events to measure estimated reductions in contract preparation.

The third completed project we reviewed was one of the two projects AMC had reviewed to determine whether expected benefits had been achieved. The chairman told us the post-implementation review had been made shortly after the system was installed at one of the national inventory control points. This system was expected to save $350,000 annually in reporting costs and reduce inventory by $3.6 million at that particular site. The inventory reduction was expected to be achieved by reducing the administrative leadtime of 3 days. In our opinion, this AMC review effort was a step in the right direction toward identifying expected and achieved benefits. But AMC performed the post-implementation review at only one and not at the other national inventory control point. Also, AMC did not document and verify that inventory reorder levels and inventories affecting administrative leadtime at each national inventory control point had actually been reduced by 3 days (the expected benefit).

The second post-implementation review of a project developed at ALMSA that AMC identified was performed in response to an Army Audit Agency

recommendation. But this review, like the other, did not document or verify that the expected $22-million[9] saving was achieved.

We have been advised that the AMC Commander has directed the Deputy Chief of Staff for Information Management to take the lead in developing and implementing a procedure to track savings resulting from completed projects so that AMC can demonstrate how it is achieving expected benefits. As a first step, AMC subordinate commands are to modify existing systems or develop new procedures to track operation and maintenance dollar savings in the fiscal year 1986/87 budget submissions. In our opinion, these data collection efforts, if properly carried out and used with a modified ALMSA cost tracking system, can be used to validate and document whether projected benefits have been achieved and whether they were worth their cost.

Agency Comments and Our Evaluation

We requested written comments on a draft of this report from the Department of Defense. Defense generally agreed with our findings and recommendations and agreed to take steps to improve the software development project procedures followed by AMC. Defense acknowledged that economic analyses had not been prepared, but it maintained that such analyses were not required for all the projects we reviewed. Moreover, Defense stated that, in the future, economic analyses will be prepared when required, and if a project is submitted for approval without the required documentation, the project will be disapproved. Defense also stated that generally accepted cost accounting standards were used by AMC in defining the cost items to be included when calculating ALMSA's hourly cost rate. We disagree and still believe that the economic analyses were required and cost accounting standards were not properly used. Appendix II contains Defense's specific comments and our responses.

Conclusions and Recommendations

AMC has not effectively managed CCSS changes through its Logistics System Review Committee because the Committee has not ensured that required procedures were followed. When a change is approved but required economic analyses are not prepared or they do not contain accurate and complete information, as well as an assessment of the projects' uncertainties, the Committee cannot ensure that (1) available resources are being used to provide the most beneficial results, (2) expected benefits are worth estimated project costs, or (3) the lowest

[9]The present value was not calculated.

cost approach has been selected and will be followed during project development. Further, without all project costs being tracked as required, so that they can be compared to development estimates and any differences reported to the Committee, the Committee is constrained in its ability to know when projects require redirection, termination, or some other form of corrective action. Also, the costs of individual change requests need to be correlated by project so the Committee and project managers will know how much is being spent on individual CCSS projects. Finally, until AMC officials begin reviewing completed CCSS projects and documenting the extent to which expected benefits are achieved, neither they nor the Committee will know whether expected benefits have been achieved or if AMC is realizing a return on the $30 million it spends annually principally to modify and expand CCSS.

We believe that, before taking any corrective action, the Secretary of the Army should consider the desirability of continuing to use the Logistics System Review Committee as the approval and project managing authority for system changes. After this has been considered, we recommend that the Secretary direct the Commander, Army Materiel Command, to:

- Ensure that the Command's approval authority adheres to all pertinent Army and AMC regulations regarding the approval of software changes and the tracking, updating, and reporting of costs associated with such changes.
- Review completed CCSS software projects to determine if expected benefits and cost reductions have been achieved, so that this information can be included as part of the Army's annual budget submission.
- See that the ALMSA director evaluates available alternatives and recommends how ALMSA's job tracking system should be modified so that all costs are collected and correlated by project.

Advance Comments From the Department of Defense

NOTE: GAO comments supplementing those in the report text appear at the end of this appendix.

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

COMPTROLLER

Mr. Frank C. Conahan
Director, National Security and
International Affairs Division
U.S. General Accounting Office
441 G. Street, N.W.
Washington, D.C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DOD) response to the General Accounting Office (GAO) draft report entitled, "Software Projects: Army Materiel Command Needs to Follow Required Procedures," dated February 3, 1986 (GAO Code 510011/OSD Case 6932).

The Department generally concurs with the GAO findings and recommendations, and is taking steps to make improvements as detailed in the attached enclosure.

Thank you for the opportunity to comment on the draft report.

Sincerely,

John R. Guetsch

Enclosure

John R. Guetsch
Acting Assistant Secretary of Defense
(Comptroller)

GAO DRAFT REPORT - DATED FEBRUARY 3, 1986
(GAO CODE 510011) - OSD CASE 6932

"SOFTWARE PROJECTS: ARMY MATERIEL COMMAND NEEDS TO FOLLOW REQUIRED PROCEDURES"

DEPARTMENT OF DEFENSE COMMENTS

* * * * *

FINDINGS

Now on pp. 2 and 8.

O FINDING A. Approval Process For Commodity Command Standard Systems (CCSS) Projects. The GAO reported that the Army Materiel Command (AMC) has six inventory control points nationwide to control stock, manage and catalog supplies, and procure and finance Army supply items. The GAO also reported that each of these control points uses common computer programs--collectively known as the AMC Commodity Command Standard System (CCSS)--to manage the control points' $24 billion inventory of supply items. The GAO found that AMC spends between $25 and $30 million annually on software projects that expand and modify the CCSS. For reviewing and approving these projects, GAO reported that AMC uses a Logistics System Review Committee (LSRC) whose members are the commanders from each of the six control points and selected senior AMC officials; the Committee is chaired by the AMC Assistant Deputy for Materiel Readiness. The GAO reported that software projects are submitted for Committee review and approval by CCSS user groups, comprised of representatives from an inventory control point and AMC headquarters who represent a functional area (such as supply, procurement, or provisioning). According to GAO, the Committee meets at the Chairman's discretion (but at least annually) to evaluate each user group's software projects against AMC's priorities and approves or disapproves the projects accordingly. (pp.1, 1-2, GAO Draft Report)

DoD Response: Concur. The methodologies and costs described by GAO concerning Commodity Command Standard Systems Automated Data Processing (ADP) systems management by AMC are substantially correct. Current AMC regulations require that the LSRC meet at the call of the chairperson, but as a minimum does convene four times annually. While project approval is an important role of the LSRC, other roles include monitoring project execution and approving project continuation and completion at the proper milestones.

Enclosure

o FINDING B. Required Economic Analyses Are Not Always Prepared. The GAO reported that Army Regulation 18-1 requires an economic analysis be prepared for new data systems and modifications expected to cost more than $100,000. The GAO observed that such analyses are required to include quantified and non-quantified mission-related objectives, such as improved performance, cost savings, or cost avoidances. The GAO also reported that AMC Regulation 15-23 requires an economic analysis be submitted to the Logistics System Review Committee for evaluation. According to GAO, this analysis helps to (1) identify the best way to develop and implement the directed project, (2) identify alternatives for developing and implementing the project, and (3) analyze expected benefits/costs. The GAO found, however, that economic analyses were not always prepared, and thus were not available for use by the Committee in approving six of 12 software projects GAO reviewed (all of which cost over $100,000). The GAO concluded that each of the six projects submitted to the Committee for approval should have included an economic analysis stating available alternatives and expected costs and benefits. The GAO also concluded that because the Committee approved the six projects without the prescribed economic analysis of alternatives, it could not be assured that the most effective and economical approach had been selected. The GAO further concluded that AMC had not effectively managed CCSS changes through its Logistics Systems Review Committee because it has not followed required procedures--i.e., when a project is approved but required economic analyses are not available, the Committee cannot ensure that (1) available resources are being used to provide the most beneficial results, (2) expected benefits are worth estimated project results, (3) the lowest cost approach has been selected. (pp. 11-15, and p. 35, GAO Draft Report)

Now on pp. 15 to 17 and 28.

DoD Response: Partially Concur. The Department agrees that an economic analysis was not prepared for six of the twelve projects reviewed by GAO. DoD maintains, however, that Army Technical Bulletin 18-109, supplement of Army Regulation (AR) 18-1, states in paragraph 1-4b(3) that an economic analysis is not required "when proposed actions are specifically directed by statute, regulation or a directive of higher authority, which preclude any choice or trade-off among alternative ways to accomplish the objective". One of the projects, Total Package/Unit Materiel Fielding, was established because of a directive of higher authority. No known alternative existed for implementation. A summary of the remaining five projects without economic analyses follows. Development of the two Army Procurement Appropriation Reporting System projects was initiated in 1975 before AR 18-1 was published. AMC policy at that time did require that benefit analyses be performed for all system changes. Accordingly, system change requests were submitted

See comment 1.

See comment 2.

See comment 3.

with cost benefit analyses and benefits were documented after implementation at the prototype command. The fourth project, the Select, Stratify, Summarize and Sequence system change was briefed extensively to the Logistics Systems Review Committee. An economic analysis was not performed because this modification was documented on a system change request (SCR) which requires that a cost benefit analysis be submitted as part of the package. A cost benefit analysis was prepared showing projected costs of $136,325 and projected cost benefits of $137,760. The modification was implemented in November 1984 and actual costs as recorded by the workload control system were $53,217.98 as of February 14, 1986. Since the system has been installed just a little over a year, it is far too early to determine actual cost benefits. The fifth project, the Provisioning Master Record (PMR) on-line system was a part of the larger PMR Redesign project for which an economic analysis was prepared. The PMR Redesign project was re-evaluated as development progressed and its scope reduced, while the PMR on-line system became more important than the major project of which it was initially a part. The economic analysis for the PMR Redesign was not updated as the system evolved and the Department agrees this should have been done. The sixth project referred to by GAO, the Common Test Data Collection System, was a contractor developed system, modified by the Army Materiel Systems Analysis Activity, which was cancelled in November 1983, after attempts at standardization failed. The project actually began in the early 1970's before present regulations governing the preparation of economic analyses were in effect. The Department agrees that when the decision was made to standardize the system and incorporate it in the CCSS in 1979, an economic analysis should have been done. In the future, the Committee will ensure that economic analyses are prepared for all projects for which they are required. Projects submitted to the Logistics Systems Review Committee for approval without the required documentation will be disapproved.

See comment 4.

See comment 5.

- FINDING C. Prepared Economic Analyses Are Flawed. The GAO reported that economic analyses had been prepared for six of the 12 projects it reviewed. The GAO observed that Army Regulation 11-28 identifies specific information to be contained in an economic analysis, and Army Technical Bulletin 18-109 specifies that benefits should be stated in dollar terms or non-monetary measurable results that can be used to estimate the projects' worth and to compare alternatives. The GAO found that the six analyses were flawed because, (1) two did not state the expected benefits in measurable terms, (2) none assessed contracting as an alternative to in-house development (3) four omitted required cost information (costs to maintain the software and costs to operate the computer center), and (4) none assessed the cost/benefit uncertainties (or risks). The GAO found that the Committee had not required that the project proposals be complete and accurate. In addition, the

GAO found that project managers were unaware of all components of information required for an economic analysis, or did not know how to estimate the cost and benefits of the projects. The GAO concluded that because contracting had not been considered as an alternative, for the projects it has approved, the Committee could not have been certain that the best possible use of AMC's limited computer resources was made at the lowest possible cost. In addition, GAO concluded that when required costs are omitted from an economic analysis, this weakened the Committee's ability to determine whether expected project benefits were commensurate with estimated costs. The GAO further concluded that AMC has not effectively managed CCSS changes through its Logistics Systems Review Committee because it has not followed required procedures--i.e., approving projects without requiring the economic analyses contain accurate and complete information, as well as an assessment of the projects' uncertainties. In GAO's view, without such information, the Committee cannot ensure that (1) available resources are being used to provide the most beneficial results, (2) expected benefits are worth estimated project costs, or (3) the lowest cost approach has been selected and will be followed during project development. (pp. 15-26, and 35, GAO Draft Report)

Now on pp. 17 to 23 and 28.

DoD Response: Concur. The Army Materiel Command (AMC) has complied with the spirit of the requirements for the preparation of economic analyses as specified in Army Regulations (AR) 11-28 and 18-1 and Army Technical Bulletin 18-109. In DoD's view, some latitude is allowed in the development of economic analyses to prevent costly research and excessive detail. Supplement 1 to AR 11-28, dated March 8, 1976, states that "Documentation of an economic analysis is required to be in sufficient detail to reconstruct it. However, this degree of detail may be excessive to the needs of the manager who must make the final decision(s) on a proposed course of action...The primary purpose of an economic analysis is to provide economic visibility in the management decision process". This Supplement goes on to state the "benefits may be expressed in either dollar values or in other quantifiable or non-quantifiable terms...quality of the products or services, e.g., reliability, maintainability, or durability of equipment items delivered, or other qualitative measures of effectiveness of the organization in accomplishing its mission".

Uncertainties (or risks) and alternatives are assessed by AMC, but they are not always documented as they should be. Similarly, the alternative of contracting for software development is always considered but not always documented by individual project. The Automated Logistics Management Systems Activity (ALMSA) contracts for approximately $2 million annually. For cost effectiveness, the contracting alternative is handled in aggregation rather than for individual projects. In addition, the total workload is reviewed to identify projects suitable for contracting, and these are further

classified by level of risk estimated to project success. The list is prioritized against available contract funds before contracts are let. To help ensure that economic analyses are more complete and that project managers are aware of all components of information required for economic analyses, AMC Pamphlet 11-28, entitled "Army Programs Economic Analysis Concepts and Methodologies", was published in July 1985.

o FINDING D. Cost Estimates Have Been Understated By The Automated Logistics Management System Activity (ALMSA). In assessing costs and benefits in the economic analyses, GAO found that the hourly rate used to estimate project development costs has been consistently understated, primarily because ALMSA incorrectly classified indirect hours as direct hours, excluded administrative support costs, and understated employee fringe benefit costs. As a result, GAO calculated higher hourly rates than ALMSA for fiscal years 1979 through 1985 (see Table I.1 on page 26 of the GAO Draft). According to GAO, using the ALMSA rates has meant that, between 1979 and 1985 AMC consistently understated development costs not only for the projects GAO reviewed, but all CCSS projects. To evaluate the impact beyond the 12 projects selected for review, GAO examined the development costs of 1,264 system change requests approved between October 1981 and May 1984, which were estimated to cost less than $100,000. The GAO found that 27 of the 1,264 requests would have been estimated as costing in excess of $100,000, had the proper hourly rate been used. As a result, GAO concluded that economic analyses should have been required before these projects could be approved. (pp. 17, 23-26, GAO Draft Report)

Now on pp. 18 and 21 to 23.

DoD Response: Partially Concur. The following components of hourly rate charges at ALMSA are involved:

(1) GAO stated that ALMSA "understated employee fringe benefit costs." This was correct and AMC recomputed the hourly rates and included the latest OSD fringe benefit rates. An updated rate for ALMSA was published in March 1985.

(2) GAO stated that ALMSA had misclassified indirect hours as direct. The position taken initially by the Department was that ALMSA had correctly classified the hours. The Department has revised its position after further examination of the calculation for determining direct labor hours, and agrees that 61,123 labor hours were incorrectly included as direct labor in determining the hourly rate. The fiscal year 1986 review of ALMSA's hourly rate will exclude those indirect labor hours from the direct labor hours.

(3) GAO stated that not all administrative support costs were included. The Department's position is that generally accepted cost accounting standards were used in developing the definitions of cost items to be included in Administrative Support Costs, and therefore, items excluded were allowable exclusions.

See comment 6.

- FINDING E: Project Costs Are Not Tracked, Updated, and Reported. The GAO reported that Army regulations require: (1) project managers to establish cost estimates by development phase and track and report costs as the development progresses so that corrective action can be taken when costs or time exceeds estimates by 15 percent, (2) project managers to update cost and benefit estimates used in economic analyses, and (3) the Committee to approve the decision on whether projects should continue, be redirected or be terminated (based upon the updated cost information). The GAO found, however, that once approved, seven of the 12 projects GAO reviewed were started without project managers establishing required cost estimates for each major development phase. In addition, the GAO found that these projects also continued to be developed without incurred costs being tracked or reported to the committee. The GAO reported that for four of the six projects supported by economic analyses, major project changes or decisions occurred, but cost and benefit estimates were not updated. The GAO further observed that because cost information was not tracked and reported to the Committee, projects were allowed to continue when required economic analysis updates should have been made to assure costs were under control and the project should be continued. GAO estimated that, for example, expected costs were exceeded by 200 percent for two of the three major projects it reviewed, which cost more that $1 million. The GAO concluded that, without all project costs being tracked so they can be compared to development estimates, with differences being reported, the Committee is constrained in its ability to know when projects require redirection, termination, or some other form of corrective action. (pp. ii-iii, pp. 27-31, p. 35, GAO Draft Report)

  Now on pp. 23 to 26 and 28.

  DoD Response: Concur. AIMSA is currently modifying its project tracking system to record time and cost estimates by development phases, to track and report actual time and cost as development progresses, and to identify when time and costs exceeds estimates. The new system will also provide for collecting cost benefits by project. This will support documentation and verification of economic analyses. The system will be completed by the end of fiscal year 1986. Reporting to the Logistics Systems Review Committee will be accomplished on a recurring basis as projects are reviewed and their performance evaluated.

- FINDING F: AIMSA Can Help Track Project Costs. The GAO found that the AIMSA project tracking system is not used to help project managers track and update project costs, as required by Army regulations. The GAO found that the AIMSA project tracking system is used to record AIMSA direct labor hours by individual system change request, but does not aggregate these hours by project, or convert the hours to dollar costs. According to the GAO, an AIMSA Division Director said the capabilities needed to capture the

direct labor hours by project could be added to the existing tracking system without major and costly modification. In the opinion of GAO, ALMSA has made no effort to identify a means of capturing a project's direct labor hours because the project managers have not tracked, updated, and reported costs as required by Army regulation. The GAO concluded that ALMSA's system can be made to relate direct labor hours to a project so that AMC project managers would have the ability to (1) track, update, and keep better informed about their project status and (2) determine when costs are being exceeded so required reports can be made to the Committee. (pp. 30-31, GAO Draft Report)

Now on pp. 25 and 26.

DoD Response. Concur. See response to Finding E.

- FINDING G: AMC Rarely Determines Whether Expected Benefits Were Achieved. The GAO found that of 28 ALMSA projects completed since 1981, AMC reviewed two in 1984 to determine whether expected benefits were achieved. For the other projects, GAO found that AMC had not collected the data needed to determine whether expected benefits had been achieved. In the opinion of GAO, the AMC review effort on the first project was a step in the right direction toward identifying expected and achieved benefits. The GAO observed, however, that AMC performed the review at only one and not at the other NICPs, and AMC did not document or verify that the expected saving was achieved. According to GAO, it has been advised that the AMC Commander has directed the Deputy Chief of Staff for Information Management to take the lead in developing and implementing a procedure to track savings resulting from completed projects so that AMC can demonstrate how it is achieving expected benefits. As a first step, GAO was advised that AMC subordinate commands are to modify existing systems or develop new procedures to track operation and maintenance dollar savings in the fiscal year 1986/87 budget submissions. In the opinion of GAO, these data collection efforts (if properly carried out in conjunction with a modified ALMSA cost tracking system) can be used to validate and document whether projected benefits have been achieved and whether they were worth their cost. The GAO concluded that until AMC officials begin reviewing completed CCSS projects and documenting expected benefits achieved, neither they nor the Committee will know whether expected benefits have been achieved or if AMC is realizing a return on the $30 million it spends annually to modify and expand CCSS. (pp. 31-35, GAO Draft Report)

Now on pp. 26 to 29.

DoD Response: Concur. The Logistics Systems Review Committee maintains close control over the development of all Automated Data Processing (ADP) systems. However, following a meeting with GAO on January 8, 1985, the Committee recognized that some shortfall had occurred in the review of benefits achieved. Subsequently, the Committee directed that for all ADP systems with projected benefits,

data will be collected on actual benefits, reported in writing to the Committee and actual savings reflected in budget submissions. These management controls (Project Management System and Labor Management System) are under development and should be in place by the end of fiscal year 1986. See response to Finding E.

RECOMMENDATIONS

Now on p. 29.

- Recommendation 1: The GAO recommended that the Secretary of the Army direct the Commander of the Army Materiel Command to ensure that the Logistics Systems Review Committee adheres to all pertinent Army and AMC regulations regarding the approval of CCSS changes and the tracking, updating, and reporting of costs associated with such changes. (p. 36, GAO Draft Report)

  DoD Response: Concur. The Department will ensure that compliance with all regulatory guidance governing changes to the Commodity Command Standard System will continue to be given management emphasis by the Army Materiel Command. See response to Findings A, B and E. In the future, projects submitted without required documentation will be disapproved. The response to Finding E describes ALMSA's actions to modify its project tracking system for tracking, updating and reporting costs.

Now on p. 29.

- Recommendation 2: The GAO recommended that the Secretary of the Army direct the Commander of the Army Materiel Command to review completed CCSS changes to determine if expected benefits and cost reductions were achieved, so that this information can be included as part of the Army's annual budget submission. (p. 36, GAO Draft Report)

  DoD Response: Concur. The Department will ensure that the results of cost benefits accumulated by the modified cost tracking system are reviewed by the Committee. Results will be included in the annual budget submission. See response to Findings E and G.

Now on p. 29.

- Recommendation 3: The GAO recommended that the Secretary of the Army direct the Commander of the Army Materiel Command to see that the ALMSA Director evaluates available alternatives and recommends how ALMSA's job tracking system should be modified so that all costs are collected and correlated by project. (p. 36, GAO Draft Report)

  DoD Response: Concur. The Department will ensure that the ALMSA Director evaluates available alternatives and recommends how the current ALMSA job tracking system should be modified in order that costs can be collected and correlated by project. Projects submitted to the Logistics Systems Review Committee for approval without the required documentation will be disapproved. See also response to Findings E and G.

The following are GAO's comments on the Department of Defense's letter dated March 17, 1986.

GAO Comments

1. Defense stated that the AMC "Total Package/Unit Materiel Fielding" project was established by directive of high authority and no known alternative existed for implementation. Moreover, the agency said that economic analyses are not required by Army regulation when proposed actions are specifically directed by higher authority in a way that precludes a choice of alternatives for accomplishing stated objectives. We agree that Army regulations provide specific conditions for when economic analyses are not required. However, in the example mentioned above, the proposed project was not directed by a higher authority; nor was a choice among alternative ways of accomplishing the project's objectives precluded when the Army granted its approval. Moreover, AMC, on June 21, 1983, requested approval for the project's concept from the Army's Vice Chief of Staff. On August 29, 1983, the Vice Chief gave his approval and the project began.

2. Defense stated that development of the two Army Procurement Appropriation Reporting System projects began in 1975, before Army Regulation 18-1 was published. We disagree. The first project was comprised of 17 system change requests showing that the project began in 1979. The ALMSA manager for this particular project confirmed the 1979 start date. In 1979, Army Regulation 18-1 required that economic analyses for all standard computer systems be operated at more than one data processing installation, as this project would be.

The second project, involving major modifications to the Army Procurement Appropriation Reporting System, was based on four system change requests dated in 1982 and 1983. At that time, Army Regulation 18-1 required that economic analyses be performed when changes to existing computer systems were estimated to be more than $100,000, as were the changes involved in this project.

3. Defense stated an economic analysis was not prepared for the Select, Stratify, Summarize and Sequence system. Rather, the system was justified with a change request, which requires a cost-benefit analysis. In fact, all of the projects we reviewed were documented on one or more system change requests that had cost-benefit analyses. AMC regulations require that a system change request, including cost-benefit analyses, document all CCSS software changes. In addition, Army Regulation 18-1 requires that economic analyses document changes that meet specified

criteria. This project, as did all the projects we reviewed, met these criteria. All the change requests we reviewed contained estimates of ALMSA development costs, but they did not contain other information required in economic analyses, such as software maintenance, hardware support, and user training costs expected over the project's anticipated life. Requests also contained an estimate of benefits, but the benefits did not have the supporting analysis required with economic analyses. Finally, change requests did not include the required evaluation of alternatives or a sensitivity analysis.

4. Defense agreed that the economic analysis for the Provisioning Master Record Redesign project should have been updated to document the on-line aspects of the project when the on-line system became more important and a separate project. In our opinion, such action would be better than no analysis at all. But we still believe the most appropriate action would have been to prepare a separate economic analysis before the project was approved. This project was started about 2 years after the redesign project started, was to be managed by AMC as a separate project, and was expected to cost over $1 million.

5. Defense agreed that when AMC decided to standardize the Common Test Data Collection System and make it a part of CCSS in 1979, an economic analysis should have been done. The agency also pointed out this project was cancelled in November 1983 after standardization attempts failed. However, in October 1984, the system's project manager (who assumed this responsibility in April 1984) told us that the project's work had been transferred to the Automated Data Collection System—a new project—in May 1984. Finally, in 1982, when the project's system change request was initiated, the change was estimated to cost over $200,000, well over the $100,000-criteria for when an economic analysis was required.

6. In addition to its written response to our draft report, Defense also told us that the cost accounting standards used were those published in the DOD 7220.9-M, Accounting Manual, which states "costs incurred are financial measures of the resources used or consumed in conducting a function or operating an activity." Further, Defense said the $2.1-million cost incurred by ALMSA was excluded because it was not consumed in designing, implementing, testing, or maintaining CCSS. Defense also stated the work-place automation projects are separate responsibilities that were added to ALMSA's overall responsibility for CCSS. While we agree that Defense has properly defined the cost accounting standard cited above, AMC did not properly use this standard when it excluded

certain administrative costs. Our review of ALMSA records shows the $2.1 million was comprised of the following:

Labor costs	
Activity Information Management Division	$ 280,638
Workplace Automation Division	874,072
Applicable overhead charges	904,709
	$2,059,419

The Activity Information Management Division is to provide automated systems for ALMSA decision making and internal applications, such as word and text processing and telecommunications. For this reason, we still believe the division's costs should be considered a part of ALMSA's operations and included when calculating ALMSA's hourly cost rate. The $69 rate we calculated was an overall ALMSA cost rate to be used in estimating both CCSS and non-CCSS project costs. We did this because ALMSA had not developed a separate rate to be used only for CCSS projects.

We agree with Defense that the Workplace Automation Division has an AMC-wide mission and thus its costs should be excluded if a separate CCSS rate is to be used. However, these costs should be excluded only if a separate rate is to be calculated and used for non-CCSS projects. If these costs are excluded, then the division's direct labor hours also should be excluded, and the costs and hours should be separately accounted for in ALMSA management reports.

Our review of ALMSA's records showed that when AMC calculated the hourly cost rate for 1984, it excluded the Workplace Automation Division's costs from the ALMSA total fiscal year cost. However, 6,932 of the division's direct labor hours were included and were used with other ALMSA direct labor hours to calculate ALMSA's 1984 hourly cost rate. We do not believe that excluding costs while including related direct labor hours follows the generally accepted cost accounting standards Defense said were used. If the Workplace Automation Division's costs are not used when calculating an hourly cost rate, then AMC also should exclude the division's direct labor hours from the calculation. If this had been done, our estimated ALMSA cost rate of $69, adjusted to reflect only CCSS costs, would be $66, which is still much greater than the $47 rate AMC computed, as shown below.

	AMC's ALMSA computation	GAO's ALMSA computation	CCSS only computation
Costs (in millions)	$21	26.6[a]	25.1
Hours	448,922	387,799[b]	380,867
Hourly cost rate	$47	$69	$66

[a]Increase over ALMSA's original figure includes $3.5 million for fringe benefits, as well as the $2.1 million in administration costs omitted by ALMSA. (See page 22 of the report.)

[b]Decrease due to 61,123 indirect labor hours which ALMSA improperly included with direct labor hours. (See page 22 of the report.)

Bibliography

We have organized the references in this bibliography alphabetically by title within the following categories:

- Army Materiel Command regulation.
- Department of the Army regulations and bulletins.
- GAO publications.
- Office of Management and Budget publications.

Army Materiel Command Regulation

Logistics System Review Committee: DARCOM Regulation No. 15-23. Alexandria, Virginia: Feb. 10, 1983. (This regulation superceded DARCOM Regulation 15-23, Feb. 8, 1980.)

Department of the Army Regulations and Bulletins

DEPARTMENT OF THE ARMY. Army Regulation 11-28: Economic Analysis and Program Evaluation for Resource Management. Washington, D.C.: Jan. 15, 1976.

———. Army Regulation 18-1: Army Automation Management. Washington, D.C.: Sept. 15, 1980. (This regulation superceded Army Regulation 18-1: Management Information Systems, May 1, 1976.)

———. Army Technical Bulletin 18-100: Army Automation Life Cycle Management. Washington, D.C.: Aug. 15, 1981.

———. Army Technical Bulletin 18-109: Army Automation Economic Analysis. Washington, D.C.: Aug. 1, 1980.

GAO Publications

General Accounting Office. Federal Agencies' Maintenance of Computer Programs: Expensive and Undermanaged, AFMD-81-25. Washington, D.C.: Feb. 26, 1981.

———. Government-Wide Guidelines and Management Assistance Center Needed to Improve ADP Systems Development, AFMD-81-20. Washington, D.C.: Feb. 20, 1981.

Office of Management and Budget Publications

OFFICE OF MANAGEMENT AND BUDGET. Circular No. A-130: Management of Federal Information Resources. Washington, D.C.: Dec. 12, 1985. (This circular superceded Circular No. A-71: Responsibilities for the Administration and Management of Automatic Data processing Activities. Washington, D.C.: Mar. 6, 1965.)

———. Circular No. A-76 (Revised): Policies for Acquiring Commercial or Industrial Type Products and Services Needed by the Government. Washington, D.C.: Mar. 29, 1979. (Superceded by Circular A-76 (Revised): Performance of Commercial Activities. Aug. 4, 1983.

———. Management of the United States Government, Fiscal Year 1986. Washington, D.C.

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